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## EUROPEAN PATENT APPLICATION

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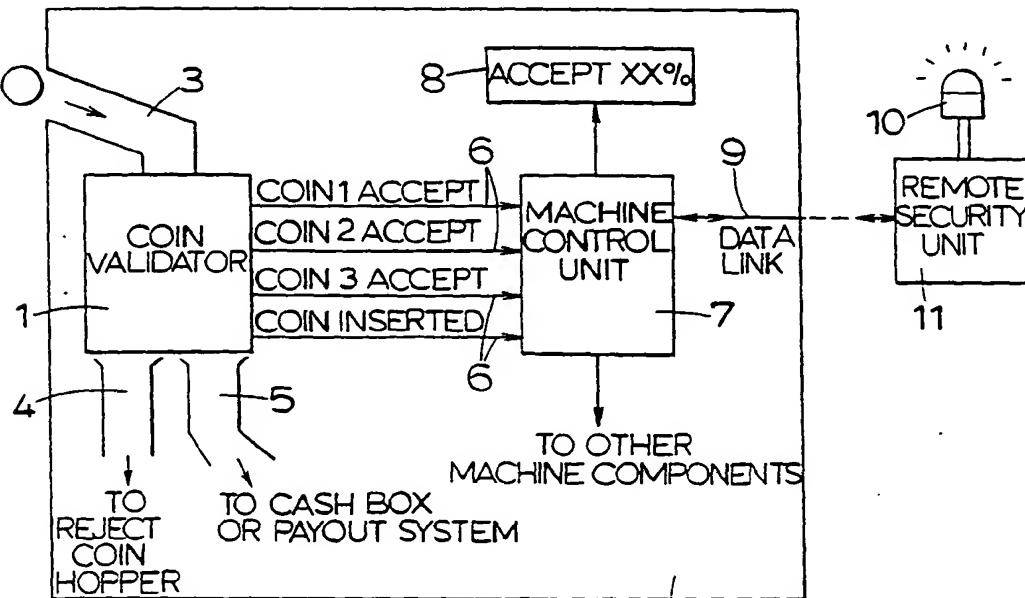
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⑤4) Coin-released apparatus.

⑤7) A system comprising coin-released apparatus (2) incorporates a coin validator (1) which monitors the acceptance ratio between the number of coins accepted for operation of the apparatus and the total number of coins (or purported coins) inserted into the apparatus. A central control unit (7) for the apparatus has a display (8) for the percentage acceptance rate and an alarm system (12) at a remote security unit (11) is arranged to be activated when the percentage acceptance rate falls below a predetermined lower limit, possibly indicating that users are attempting to feed false coins into the apparatus (2).



## COIN-RELEASED APPARATUS

This invention relates to systems comprising coin-released apparatus such as vending machines, amusement and gaming machines, change-givers and public telephones, and so-called coin validators with which such machines are equipped.

5 Coin validators are generally self-contained devices, the construction of which is much the same regardless of the function of the machine to which they are fitted. The purpose is to check that the coin inserted by the user is of the correct denomination and is not a foreign coin or say, a washer or other similar disc. In the past this was done mechanically by sensing the diameter, thickness, weight, magnetic properties, presence or absence of a milled edge, presence or absence of a hole in the middle and so on, but nowadays it is done largely electronically by sensing the waveform of the pulse induced in it by a coil 10 as it passes through a high frequency field; this pulse is compared with stored information on that generated by a coin of the correct denomination.

In either case, if the coin fails to fulfil the criteria it is rejected and returned to the user; if it meets them it initiates operation of the machine and is passed to a coin store.

15 The setting of the mechanism is critical, if the limits are too wide then it will accept a proportion of false coins and this represents a direct loss to the operator or owner of the machine; if the limits are set unduly narrow then it will reject a proportion of perfectly valid coins, for example those which are worn or dirty. This last result can produce considerable annoyance in the user, and this in turn can lead to the machine being damaged.

20 Moreover, even if the coin validator is initially set up with acceptable limits on the various testing criteria, these limits can change with time, due to wear in mechanical parts or drift in the values of electrical components.

25 The aim of the invention is to overcome the excessive losses and/or damage resulting from incorrect operation of the coin validator. According to the invention a coin validator, or a system comprising coin-released apparatus and a coin validator incorporates means for monitoring the acceptance/rejection ratio between the number of coins (or purported coins) inserted and the number accepted or rejected, and means for issuing an alarm signal and/or for indicating that corrective action may be necessary when the ratio departs outside predetermined limits.

30 The acceptance/rejection ratio may be monitored by counting the total number of coins inserted and the number of coins rejected. However, it will be appreciated that one could instead count the total number of insertions and the number accepted, or simply the number accepted and the number rejected. Any two of the three possible figures will give sufficient information to reveal a change in the behaviour pattern, indicating that the acceptor mechanism requires adjustment or that the machine is being misused.

35 The ideal ratio should be constant for a given location, but is by no means the same everywhere. For example it is likely that machines in ports or at least airports will habitually have inserted in them a higher proportion of foreign coins than those in say, a country town. It is to be expected that amusement machines in well-regulated clubs will receive a lower proportion of faulty coins or of discs than those in amusement arcades. However, for a given location, barring an exceptional change in the usage pattern, an alteration in the average number of coins rejected generally indicates a drift in the mechanism itself that needs correcting. Alternatively it may indicate that repeated attempts are being made by a particular user or group 40 of users to insert false coins; again, an indication of this fact is desirable.

45 The basic method of achieving the result according the invention need not be described in detail as it only requires counters of a known kind, for example employing optical switches or micro-switches, and connected to a circuit for continually comparing their recorded values over pre-set periods or pre-set totals. It is already usual to count the coins that are accepted by the validator. Hitherto it has not been known to count also those which pass to the rejection chute.

The monitoring system can be arranged to take action if the acceptance rate falls rapidly below the normal range, such as might indicate an attempt at fraudulent use, and in that case it could be used not only to trigger a remote alarm but also to disable the machine.

50 The details of the variation in the acceptance/rejection ratio even within acceptable limits, may be recorded and stored for subsequent analysis. The length of time, or the number of insertions, over which the acceptance/rejection ratio is calculated can vary according to the exact use to which the information is to be put.

A sudden downward shift in the acceptance rate over a short period of time may indicate fraudulent use or a significant malfunction, whereas a gradual deterioration over a large number of coin insertions might indicate that a maintenance action such as internal cleaning or adjustment is necessary.

A more comprehensive system might include additional signals referring to various parameters of the inserted coin, such as its diameter, thickness, mass, material etc. These additional signals could yield useful information as to the parameters on which rejected coins were judged to be invalid, and from an evaluation of 'near misses' attempted fraudulent manipulation could be detected, in particular in the case of illegally-manufactured counterfeit coins or 'slugs'. This information could be stored in a similar manner to the acceptance rate data, within the coin machine for immediate or subsequent display or action, or transmitted to a separate internal or external data store used as an independent security monitoring device.

The accompanying sketches show in Figure 1 a relatively simple system according to the invention and in Figure 2 a more comprehensive one of the kind indicated in the paragraph above.

The system shown in Figure 1 comprises a coin validator 1 incorporated within coin-released apparatus 2 and disposed between a coin entry chute 3, a coin exit chute 4 leading to a reject coin hopper (not shown) and another chute 5 leading to a cash box or payout system (not shown) of the coin-released apparatus 2.

The coin validator 1 not only counts the number of coins accepted which pass into chute 5 and travel down to the cash box or payout system, but also counts the number of coins or purported coins either inserted into the coin entry chute 3 or which pass into the coin exit chute 4 so that the ratio of accepted/rejected coins to the total number of coins inserted into the entry chute 3 can be determined.

In the simple system as shown in Figure 1 information on the numbers of each of three different kinds of coin accepted and on the total number of coins inserted is fed from the coin validator along data channels 6 into a central control unit 7 for the coin released apparatus which has a local display 8 of the percentage acceptance rate and is also connected by a data link 9 to an alarm system 10 in a remote security unit 11 which could, for example in an amusement arcade, be common to a group of machines.

Predetermined upper and lower limits for the percentage acceptance rate are stored either in the coin validator 1, the central control unit 7 or in the remote security unit 11, and the alarm system 10 is arranged to sound an alarm either when the percentage acceptance rate falls below the predetermined lower limit, possibly indicating that repeated attempts are being made by a user or users to insert false coins into the apparatus 2, or when the percentage acceptance rate rises above the predetermined upper limit, possibly indicating that the coin rejection mechanism of the coin validator is faulty and in need of maintenance.

Figure 2 shows an enhanced system similar to the simple system of Figure 1, but in which the coin validator 1 also obtains information referring to different parameters of the coins inserted into the entry chute 3 or at least of all the coins rejected and which pass into the coin exit chute 4. Extra data channels 16 are provided along which coin parameter signals are passed to the central control unit 7 of the coin-released apparatus. Also, at the remote security unit 11 a print-out 12 is made showing the proportions of each class of insertion rejected. For example the print-out 12 may display information as follows:

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Coin denomination	No. of Coins	
	inserted	rejected
£1	87	6
50p	246	9
20p	322	89

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From the above example it will be seen that there is evidently a potential problem developing in respect of the 20p coins.

Whilst we have spoken above solely of coins it will be understood that the invention is not confined to use with coins of the realm but could equally well be applied to machines designed to receive tokens. Moreover the same principle could be extended to machines which accept banknotes rather than coins.

### Claims

55 1. A coin validator (1) for coin-released apparatus or a system comprising coin-released apparatus (2) and a coin validator(1), wherein the coin validator determines whether or not coins or purported coins inserted into the apparatus (2) are of the correct denomination for operation of the apparatus and which accepts those coins of the correct denomination and rejects those coins or purported coins which fail to

satisfy the criteria for acceptance, characterised by means (1,7) for monitoring the acceptance/rejection ratio between the number of coins or purported coins accepted or rejected and the number of coins or purported coins inserted, and means (10,11) for issuing an alarm signal and/or for indicating that corrective action may be necessary when the ratio departs outside predetermined limits.

- 5 5. A coin validator or a system as claimed in claim 1 in which the acceptance/rejection ratio is monitored by counting the total number of coins inserted and the number of coins rejected.
- 6 3. A coin validator or a system as claimed in claim 1 in which the acceptance/rejection ratio is monitored by counting the total number of coins inserted and the number of coins accepted.
- 7 4. A coin validator or a system as claimed in claim 1 in which the acceptance/rejection ratio is monitored by counting the number of coins accepted and the number of coins rejected.
- 8 5. A coin validator or a system as claimed in any preceding claim in which the acceptance/rejection ratio is continuously monitored and details of the variation in the ratio are recorded.
- 9 6. A coin validator or a system as claimed in any preceding claim which is arranged to disable the coin-released apparatus if the acceptance ratio falls rapidly below a predetermined limit or if the rejection ratio rises rapidly above a predetermined limit.
- 10 7. A coin validator or a system as claimed in any preceding claim which is arranged to indicate that a maintenance action is necessary if the acceptance/rejection ratio falls or rises gradually over a large number of coin insertions.
- 11 8. A coin validator or a system as claimed in any preceding claim which is arranged to monitor additional signals (16) referring to various parameters of the inserted and/or rejected coins.

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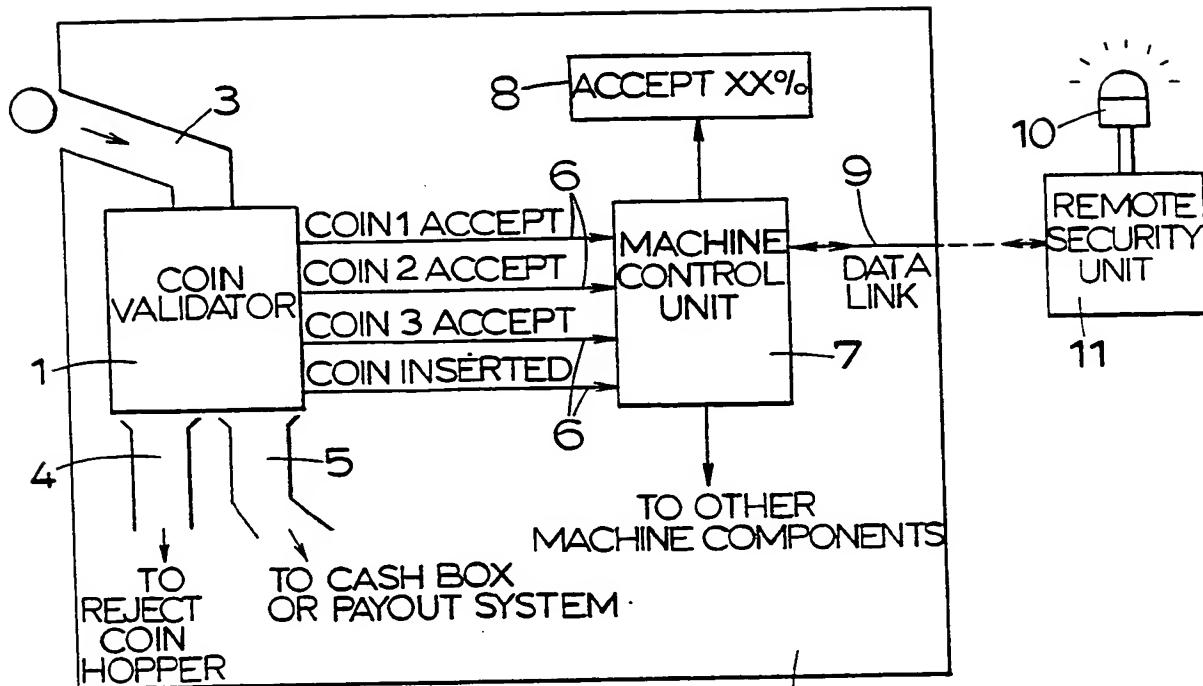


FIG. 1

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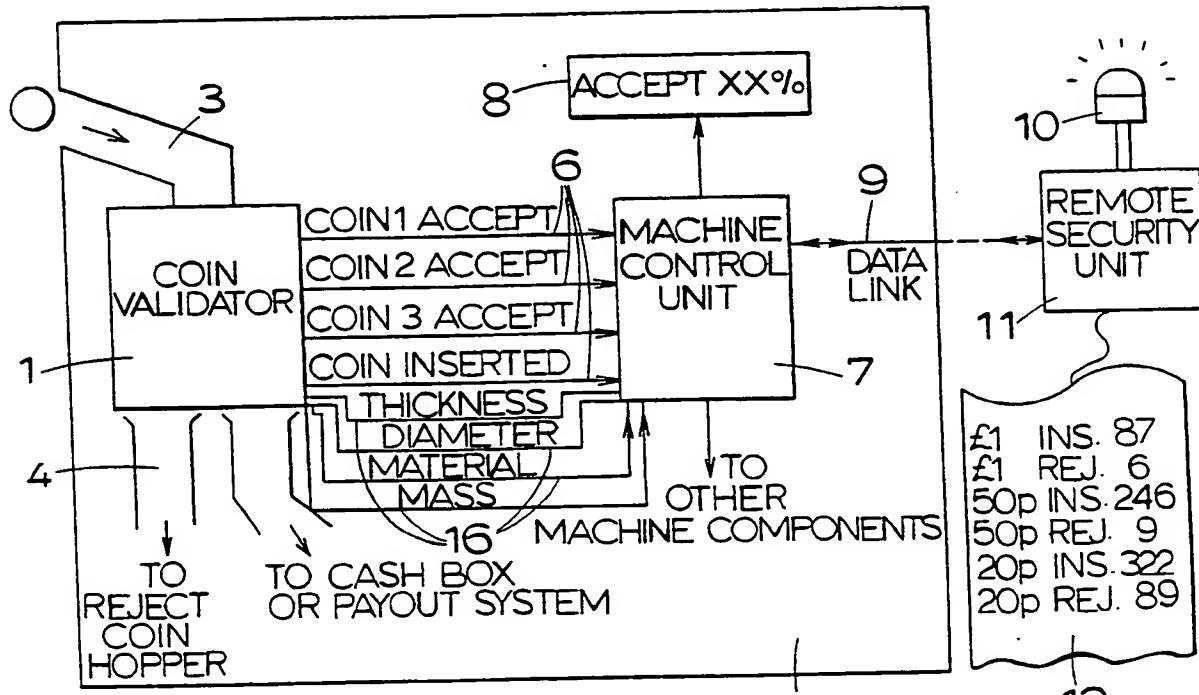


FIG. 2

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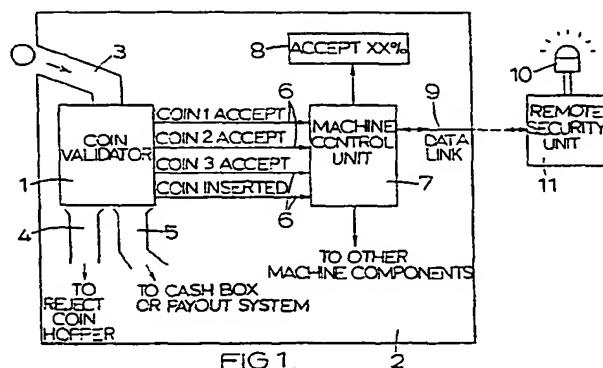
⑬ Designated Contracting States: ES FR NL

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EP 88304647.6

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	TECHNICAL FIELDS SEARCHED (Int. Cl.)
A	<u>EP - A2 - 0 151 761</u> (URMET S.P.A.) * Totality * --	1	G 07 F 9/08
A	<u>GB - A - 2 182 477</u> (NATIONAL REJECTORS INC. GMBH) * Totality * --	1	
A	<u>EP - A2 - 0 086 648</u> (MARS INCORPORATED) * Totality * --	1	
A	<u>US - A - 4 666 027</u> (OSTROSKI et al.) * Totality * --	1	
A	<u>DE - A1 - 3 333 511</u> (AUTOMATEN AG) * Totality * ----	1	
The present search report has been drawn up for all claims			G 07 D 3/00 G 07 D 5/00 G 07 F 3/00 G 07 F 5/00 G 07 F 9/00
Place of search	Date of completion of the search	Examiner	
VIENNA	12-07-1989	BEHMER	
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
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